



# UNITED STATES PATENT AND TRADEMARK OFFICE

cel

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/087,741	03/05/2002	Sang-Hyuck Ahn	61610013AA	7018
58027	7590	03/06/2006	EXAMINER	
H.C. PARK & ASSOCIATES, PLC			DONG, DALEI	
8500 LEESBURG PIKE			ART UNIT	
SUITE 7500			PAPER NUMBER	
VIENNA, VA 22182			2879	

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/087,741	AHN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Dalei Dong	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>11/7/2005</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 20, 2005 has been entered.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,436,221 to Chang.

Regarding to claim 1, Chang discloses in Figure 1, a method for fabricating a field emission display, comprising: forming a cathode electrode (20) on a substrate (10); forming an emitter (30) having a carbon-based material (see column 1, lines 33-37) on the cathode electrode (20); depositing an emitter surface treatment agent (adhesive film

or polymer film) on the substrate (10) to cover the emitter (30) after forming the emitter (see column 3, lines 55-60); hardening the emitter surface treatment agent (the Examiner interprets that the adhesive film or the polymer film is sufficiently harden when deposited on top of the emitter); and removing the harden emitted surface treatment agent (see column 3, line 60) from the substrate (10) such that the carbon-based material contained in the emitter can be exposed.

Regarding to claim 2, Chang discloses in Figure 1, printing a paste having the carbon-based material (30) on the cathode electrode (20) (see column 1, lines 33-35); and heat-treating the printed paste at a temperature lower than a complete-baking temperature for the paste (see column 3, lines 54-55).

Regarding to claim 3, Chang discloses in Figure 1, the paste (30) is printed through a screen-printing process using a metal mesh screen (see column 1, lines 33-35).

Regarding to claim 4, Chang discloses in Figure 1, the carbon-based material is selected from the group consisting of a carbon nanotube, graphite, and diamond (see column 1, lines 35-37).

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2879

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5, 6, 10, 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang in view of U.S. Patent No. 6,645,402 to Kurokawa.

Regarding to claim 5, Chang discloses in Figure 1, a method for fabricating a field emission display, comprising: forming a cathode electrode (20) on a substrate (10); forming an emitter (30) having a carbon-based material (see column 1, lines 33-37) on the cathode electrode (20); depositing an emitter surface treatment agent (adhesive film or polymer film) on the substrate (10) to cover the emitter (30) after forming the emitter (see column 3, lines 55-60); hardening the emitter surface treatment agent (the Examiner interprets that the adhesive film or the polymer film is sufficiently harden when deposited on top of the emitter); and removing the harden emitted surface treatment agent (see column 3, line 60) from the substrate (10) such that the carbon-based material contained in the emitter can be exposed.

However, Chang does not disclose the emitter surface treatment agent is deposited through a spin-coating process.

Kurokawa teaches in Figures 3-6, a method for fabricating a field emission display, comprising: depositing the emitter surface treatment agent (20 cc of a solution obtained by diluting isobutyle methacrylate with butyl carbitol along with organic material-6) by spin coating process (see column-18, lines-24-27) for the purpose of realizing a highly efficient electron emitting device by facilitating electron emission.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilize the spin coating process of Kurokawa for depositing the surface treatment agent of Chang in order to realize a highly efficient electron emitting device by facilitating electron emission.

Regarding to claim 6, Kurokawa teaches in Figures 3-6, the emitter surface treatment agent is hardened by a heat-treatment process (see column 8, lines 55-64) and the motivation to combine is the same as in claim 5.

Regarding to claim 10, Regarding to claim 10, Chang discloses in Figure 1, a method for forming a carbon-based emitter, comprising: forming an emitter (30) including a carbon-based material (see column 1, lines 33-37); forming a surface treatment agent (adhesive film or polymer film) over the emitter (30) after forming the emitter; removing at least a portion of the treatment film (see column 3, lines 55-60).

However, Chang does not disclose heating the surface treatment agent for forming a treatment film.

Kurokawa teaches in Figures 3-6, a method for fabricating a field emission display, comprising: heating the surface treatment agent (20 cc of a solution obtained by diluting isobutyle methacrylate with butyl carbitol along with organic material 6) for forming a treatment film (see column 8, lines 55-64) for the purpose of realizing a highly efficient electron-emitting device by facilitating electron-emission.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the heating process of Kurokawa for the surface treatment agent of Chang in order to realize a highly efficient electron emitting device by facilitating electron emission.

Regarding to claim 11, Chang discloses in Figure 1, the carbon-based emitter is used in a field emission display.

Regarding to claim 15, Chang discloses in Figure 1, the carbon-based material includes at least one of carbon nanotube, graphite, and diamond (see column 1, lines 35-37).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang in view of U.S. Patent No. 6,623,720 to Howard.

Regarding to claim 7, Chang discloses in Figure 1, a method for fabricating a field emission display, comprising: forming a cathode electrode (20) on a substrate (10); forming an emitter (30) having a carbon-based material (see column 1, lines 33-37) on the cathode electrode (20); depositing an emitter surface treatment agent (adhesive film or polymer film) on the substrate (10) to cover the emitter (30) after forming the emitter (see column 3, lines 55-60); hardening the emitter surface treatment agent (the Examiner interprets that the adhesive film or the polymer film is sufficiently harden when deposited on top of the emitter); and removing the harden emitted surface treatment agent (see

column 3, line 60) from the substrate (10) such that the carbon-based material contained in the emitter can be exposed.

However, Chang does not disclose the emitter surface treatment agent is a polyimide solution.

Howard teaches a method of making a field emission display using carbon nanotubes wherein a sacrificial layer made of polyimide is deposited and then removed to better expose the nanotubes (see column 4, lines 5-10).

Howard also teaches that the removable sacrificial layer (or “surface treatment layer”) should be made of a material that does not have detrimental effects to the emissive layer, and teaches that polyimide material is a suitable sacrificial or surface treatment layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use polyimide material for the surface treatment because it is non-harmful suitable material for the removable surface treatment layer, as evidenced by Howard.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang.

Regarding to claim 8, Chang discloses the claimed fabrication method of claim 2, wherein the printed paste (30) is heat treated at the temperature of about 350-430 degrees Celsius (see column 3, lines 62-65). Chang however, does not explicitly disclose the duration of the sintering process. However, it is well known in the art to heat treat the



carbon nanotubes for a few minutes at a such temperature in order to successfully perform curing. Therefore, it would have been obvious to one having ordinary skill in the art to have heat treated the printed paste of Chang for about two minutes, in order to solidify the CNT on the cathode electrode.

8. Claims 9, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang in view of U.S. Patent No. 6,645,402 to Kurokawa and in further view of U.S. Patent No. 6,013,238 to Murata.

Regarding to claim 9, Chang in view of Kurokawa discloses the method of manufacturing a field emission display in claim 6; however, Chang and Kurokawa does not disclose deposit the surface treatment agent located on a hot plate.

Murata teaches in column 13, lines 65-67, makes it clear that the hot plate method is a well-known, conventional method used for heating elements in field emission display. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a hot plate instead of the process of heating as disclosed by Kurokawa - since applicant has not shown that any particular advantage comes of using a hot plate at 90 degrees C for 20 minutes versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Regarding to claim 13, since applicant has not shown that any particular advantage comes of using a hot plate at 90 degrees Celsius versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Regarding to claim 14, since applicant has not shown that any particular advantage comes of using a hot plate for 20 minutes versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang in view of U.S. Patent No. 6,645,402 to Kurokawa and in further view of U.S. Patent No. 6,623,720 to Howard.

Regarding to claim 12, Chang in view of Kurokawa discloses a method for forming a carbon-based emitter, comprising: forming an emitter including a carbon-based material; forming a surface treatment agent over the emitter after forming the emitter; heating the surface treatment agent for forming a treatment film; and removing at least a portion of the treatment film.

However, Chang and Kurokawa does not disclose the surface treatment agent is polyimide solution material.

Howard teaches a method of making a field emission display using carbon nanotubes wherein a sacrificial layer made of polyimide is deposited and then removed to better expose the nanotubes (see column 4, lines 5-10).

Howard also teaches that the removable sacrificial layer (or “surface treatment layer”) should be made of a material that does not have detrimental effects to the emissive layer, and teaches that polyimide material is a suitable sacrificial or surface treatment layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use polyimide material of Howard for the surface treatment agent of Chang and heated according to Kurokawa because it is non-harmful suitable material for the removable surface treatment layer.

### ***Response to Arguments***

10. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following prior art are cited to further show the state of the art of a method of fabricating a field emission display.

U.S. Patent Applicant No. 2004/0224081 to Sheu.

Art Unit: 2879

U.S. Patent No. 2006/0022578 to Ryu.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dalei Dong whose telephone number is (571)272-2370. The examiner can normally be reached on 8 A.M. to 5 P.M..

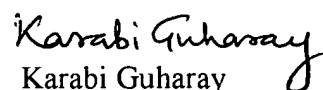
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar Patel can be reached on (571)272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



D.D.

March 1, 2006

  
Karabi Guharay  
Primary Examiner  
Art Unit 2879